Haruki HIRABAYASHI*: **Chromosome numbers in several species of the Aspidiaceae**

平林春樹*: オシダ科数種の染色体数

In this paper the author wishes to report the results of cytological observations on 26 taxa in the Aspidiaceae (by Copeland). Meiotic material was fixed in Farmer's fluid or Newcomer's solution and squashed in aceto-carmin stain. The taxa employed and the gametic chromosome numbers counted are listed in Table 1.

Observations and discussion

Acystopteris japonica var. *taiwaniana*. The specimen collected in Taiwan was a sexual tetraploid having n=84. *A. japonica* considered as the basic species of this variety is a sexual diploid having n=42 (Kurita 1962, Mitui 1968). So it is clear that there is a relationship of 2x-4x between the basic species and its variety.

Ctenitis. Two species investigated were sexual diploids, each showing n=41 during meiosis (Figs. 1, 2) and giving rise to 64 viable spores per sporangium. It may be said that each of them occupies the stable specific status and it is left behind in the speciation.

Dictyocline griffithii var. *wilfordii*. Mitui (1968) counted n=144 for the specimen from Taiwan. On the specimen in Japan the author also observed 144 chromosome pairs at meiosis (Fig. 4) and 64 viable spores per sporangium. It has been considered that *Dictyocline* may have closely related to *Leptogramma* on the basis of morphological investigation. Cytologically *Leptogramma* has x=36 as the basic chromosome number. Therefore it seems that this plant possesses an octoploidy which is a high level of ploidy in the Aspidiaceae.

Gymnocarpium oyamense. For this species, Kurita (1962) reported n=80, Mitui (1968) n=40 and the author also counted n=40 (Fig. 5). Hence it is probable that this species has intraspecific polyploidy, diploidy and tetraploidy.

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Tab. 1. Chromosome numbers in several species of the Aspidiaceae.

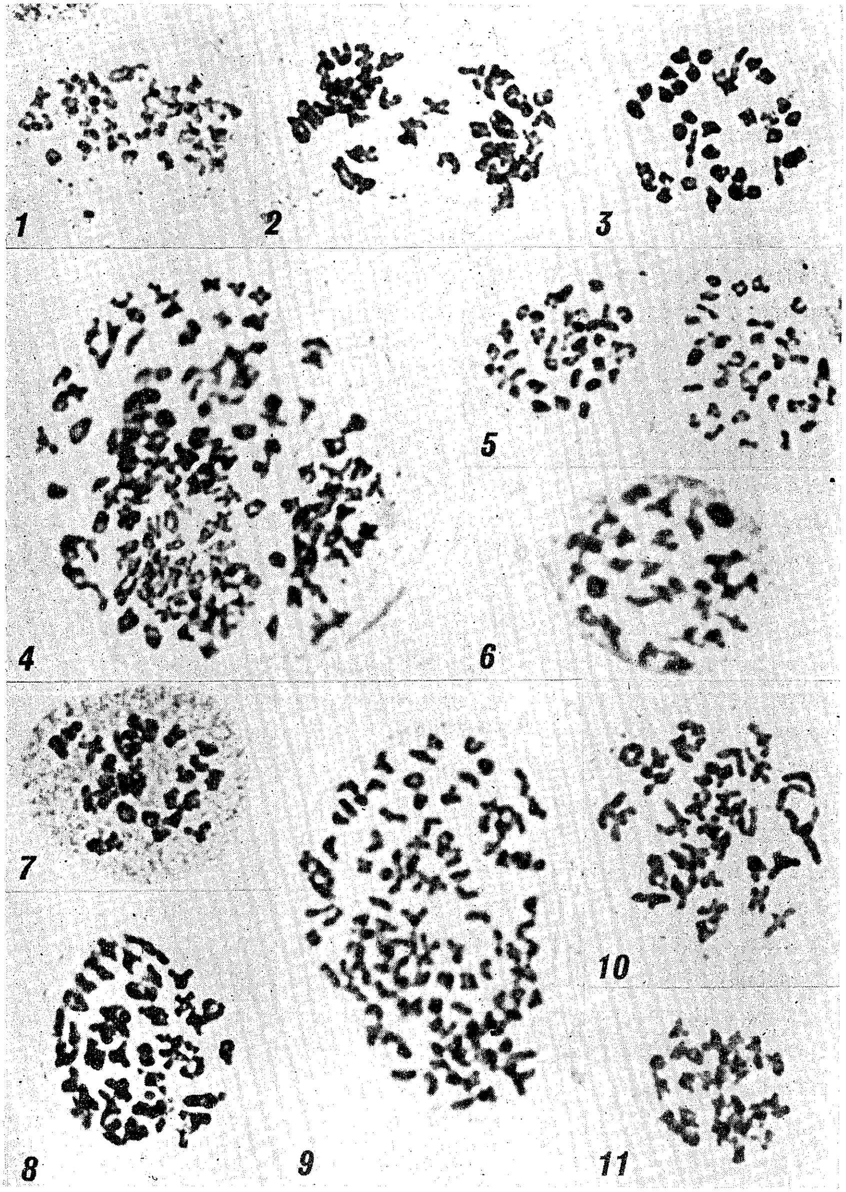
Taxon	Locality	n	Level of ploidy	Fig.	Previous report
Acystopteris japonica Nakai var. *taiwaniana* Tagawa (Usuhimewarabimodoki)	Arisan, Taiwan	84	4x	—	———
Arachniodes maximowiczii Ohwi (Nantaisida)	Zyumonzitoge, Nagano Pref.	41	2x	—	n=41 (K.* 1967, M.* 1968)
A. mutica Ohwi (Sinobukaguma)	Aokigahara, Yamanasi Pref.	41	2x	—	n=41 (M. 1968), n=82 (K. 1967)
Ctenitis maximowicziana Ching (Kiyosumihimewarabi)	Owase, Mie Pref.	41	2x	1	n=41 (K. 1961)
C. subglandulosa Ching (Katumouinode)	Kosugidani, Yakusima	41	2x	2	———
Cyclosorus truncatus Farwell (Natagirisida)	Taito, Taiwan	36	2x	3	n=36 (M. 1968)
Dictyocline griffithii Moore var. *wilfordii* Moore (Amisida)	Owase, Mie Pref.	144	8x	4	n=144 (M. 1968)
Gymnocarpium oyamense Ching (Ebirasida)	Titibu, Saitama Pref.	40	2x	5	n=80 (K. 1962), n=40 (M. 1968)
Leptogramma totta J. Smith (Mizosida)	Takaosan, Tokyo Pref.	36	2x	—	n=36 (K. 1960, M. 1968)
Phegopteris aurita J. Smith (Haimimigatasida)	Kosugidani, Yakusima	31	2x	—	———
P. bukoensis Tagawa (Tatihimewarabi)	Zyumonzitoge, Nagano Pref.	31	2x	6	n=c. 30 (K. 1960)
P. decursive-pinnata Fée (Gezigezisida)	Hakone, Kanagawa Pref.	30	2x	—	n=30, 90/2, 60 (M. 1965–67) n=60 (K. 1960)
〃	Kosugidani, Yakusima	60	4x	—	

P. polypodioides Fée (Miyamawarabi)	Amigasayama, Yamanasi Pref.	30	2x	7	n='90' (Manton 1950, Britton 1953, Sorsa 1958)
P. pyrrhorachis Tagawa (Niitakawarabi)	Arisan, Taiwan	90	6x	—	————
Polystichum lepidocaulon J. Smith (Orizurusida)	Kiyosumiyama, Tiba Pref.	41	2x	—	n=41 (M. 1967)
P. obai Tagawa (Amamidenda)	cultivated in Bot. Garden Tokyo Univ.	41	2x	8	n=41 (K. 1967)
P. polyblepharum Pr. (Inode)	Hakone, Kanagawa Pref.	82	4x	—	n=82 (K., M. 1966)
P. tripteron Pr. (Zyumonzisida)	Hakone, Kanagawa Pref.	41	2x	—	n=41 (K. 1962, M. 1968)
P. tsus-simense J. Smith (Himekanawarabi)	Takaosan, Tokyo Pref.	'123'	3x	9	n='123' (M. 1965)
Thelypteris beddomei Ching (Hosobasyorima)	Kosugidani, Yakusima	31	2x	—	n=31 (Manton 1953)
T. brunnea Ching	Cameron Highlands, Malaya	36	2x	—	————
T. oligophlebia Ching var. *elegans* Ching (Himewarabi)	Takaosan, Tokyo Pref.	31	2x	11	n=62 (M. 1968)
T. palustris Schott (Himesida)	Azusayama, Nagano Pref.	36	2x	10	n=36 (M. 1967)
T. subochthodes Ching (Ibukisida)	Owase, Mie Pref.	36	2x	—	n=36 (K. 1961, M. 1968)
"	Kusukawa, Yakusima	36	2x	—	
T. uraiensis Ching (Taiwanhariganewarabi)	Kosugidani, Yakusima	62	4x	—	————
Woodsia polystichoides Eaton (Iwadenda)	Azusayama, Nagano Pref.	41	2x	—	n=41 (K. 1962, M. 1968)

* Initials of author's name. K: Kurita, S. M: Mitui, K.

Tab. 2. Comparison of 28 specimens in *Phegopteris polypodioides*.

Locality & Date collected	Collect. no.	Chromosome numbers (n)	Number of spore per sporangium	Stomatal length (μ) Aver. of 50 stomata	Stomatal length (μ) Mean	Stomatal length (μ) Ratio	Reproduction & Level of ploidy
Mitugasira, Yatugatake, Yamanasi Pref. Aug. 9, 1965	2130	—	64	29.06	29.37	—	sexual probab. 2x
	2131	—	64	28.23			
	2132	—	64	30.81			
Azusayama, Minamisakugun, Nagano Pref. Jul. 29, 1966	2804	—	64	35.71	35.00	100	sexual probab. 2x
	2805	—	64	34.98			
	2806	—	64	34.98			
	2808	—	64	34.34			
	2787	—	32	41.26	40.53	116	apogamous probab. 3x
	2789	—	32	39.88			
	2807	—	32	40.45			
Sanpukutoge, Simoinagun, Nagano Pref. Aug. 22, 1966	2846	—	64	39.01	39.27	100	sexual probab. 2x
	2847	—	64	39.34			
	2850	—	64	39.08			
	2851	—	64	38.25			
	2852	—	64	40.09			
	2853	—	64	39.86			
	2845	—	32	45.11	44.60	114	apogamous probab. 3x
	2848	—	32	44.02			
	2849	—	32	44.66			
Amigasayama, Yatugatake, Yamanasi Pref. Jul. 17, 1968	3481	30	64	38.55	37.26	—	sexual 2x
	3483	30	64	36.26			
	3484	30	64	37.82			
	3485	30	64	38.94			
	3488	30	64	36.01			
	3489	30	64	36.35			
	3492	30	64	37.40			
	3493	30	64	37.08			
	3498	30	64	36.97			



Figs. 1-11. Chromosomes at meiosis. All ca. ×1000. 1. *Ctenitis maximowicziana* n=41. 2. *C. subglandulosa* n=41. 3. *Cyclosorus truncatus* n=36. 4. *Dictyocline griffithii* var. *wilfordii* n=144. 5. *Gymnocarpium oyamense* n=40 (2 cells). 6. *Phegopteris bukoensis* n=31. 7. *P. polypodioides* n=30. 8. *Polystichum obai* n=41. 9. *P. tsus-simense* n='123'. 10. *Thelypteris palustris* n=36. 11. *T. oligophlebia* var. *elegans* n=31.

Phegopteris polypodioides. Nine specimens collected in Amigasayama all were sexual diploids, each showing 30 bivalents during meiosis (Fig. 7) and giving rise to 64 viable spores per sporangium. Manton (1950) described that this species is an apogamous fern having n='90' by the cytological studies of specimens from British Isles and Sweden. Momose (1967) observed the prothallium of this plant in Japan and described that this species is only one for apogamous fern in the Japanese species of the Thelypteridaceae (by Holttum). Therefore the author was compelled to examine the presence of an apogamous triploid in his other collections of this species. However 19 fixed specimens from other three localities, Mitugasira, Azusayama and Sanpukutoge, all were not suitable to count chromosome number, since their meiotic metaphases ended. Then the comparisons of these 28 fixed specimens all, on the spore number per sporangium and the stomatal length were made. The results of these estimates are showed in Table 2. The data indicate that 6 specimens (3 in Azusayama and 3 in Sanpukutoge) are obviously apogamous. These apogamous specimens are probably triploid. If this is so, it may be said that this species has an intraspecific polyploidy of sexual diploid and apogamous triploid. Further this suggests even the possibility of presence of a tetraploidy cytotype. In this table, it should be noted that there is a difference between the mean values of stomatal length of the same cytotype specimens from different localities. For comparison of two cytotypes, therefore, the ratio of stomatal length between the two cytotypes in each of localities was considered.

Thelypteris oligophlebia var. *elegans*. Mitui (1968) reported n=62 for this taxon. The specimen employed in the present study shows 31 bivalents during meiosis (Fig. 11) and has 64 viable spores per sporangium. Therefore it seems that this fern possesses an intraspecific polyploidy, diploidy and tetraploidy.

The author wishes to express his cordial thanks to Prof. H. Ito, Tokyo University of Education, for helpful guidance and for identification of the materials.

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オシダ科に属する 23 種 3 変種の染色体数を調べ表 1 のような結果を得た。

1. ウスヒメワラビモドキは n=84 で，その母種と考えられているウスヒメワラビが二倍体であるのに対し，四倍体である。

2. 八ケ岳編笠山産ミヤマワラビは n=30 の二倍体であった。マントンにヨーロッパ産で n='90'（無配生殖）の報告があり，また百瀬は日本産の前葉体の研究からそれが無配生殖であることを記載している。そこで，手持ちの，減数分裂を観察するには遅すぎた固定標本の中に無配生殖個体があるかどうかを確かめるために，その全部について 1 胞子のう中の胞子数と気孔長比を調査比較してみた。結果は表 2 のとおりで，これは明らかに無配生殖個体の存在を示している。この個体は，マントンの報告に照らし，おそらく三倍体であろう。したがって日本産ミヤマワラビには二倍性と三倍性の種内倍数性があると推定される。

3. ヒメワラビは n=31 の二倍体であった。三井はすでに n=62 を報告しているので，この種にも，二倍性と四倍性の種内倍数性があることが明らかとなった。またエビラシダにも同じく二倍体と四倍体のサイトタイプがあり，これについては未記載なのでここで触れておきたい。

4. その他，高倍数体として，アミシダ (n=144) の八倍体，ニイタカワラビ (n=90) の六倍体が注目される。

○植物採集覚書（其三十）（奥山春季） Shunki OKUYAMA: Tentative list of plants for collectors (30)

九州地方（其四）

○対馬（長崎県）原標本植物 *Asplenium Wardii* Hook.〔ツクシイヌワラビ〕Sp. Fil. 3: 189 (1860). *Sedum Yabeanum* Makino ツシママンネングサ 植雑 17: 10 (1903). *Stellaria sessiliflora* Yabe ツシマハコベ（→ミヤマハコベ）植雑 17: 194 (1903). *Ligusticum tsusimense* Yabe ツシマノダケ 植雑 18: 30 (1904). *Acer Sieboldianum* var. *tsusimense* Koidz. コハイタヤメイゲツ Rev. Acer. Jap. 37 (1911). *Sorbus Wilfordii* Koehne〔ツシマナナカマド〕Fedde Rep. 10: 503 (1912). *Rubus Thunbergii* var. *Harai* Makino ヤエザキクサイチゴ 植雑 27: 79 (1913).